



# **AATT RTO-3**

## **Development of a Free-Flight Simulation Infrastructure**

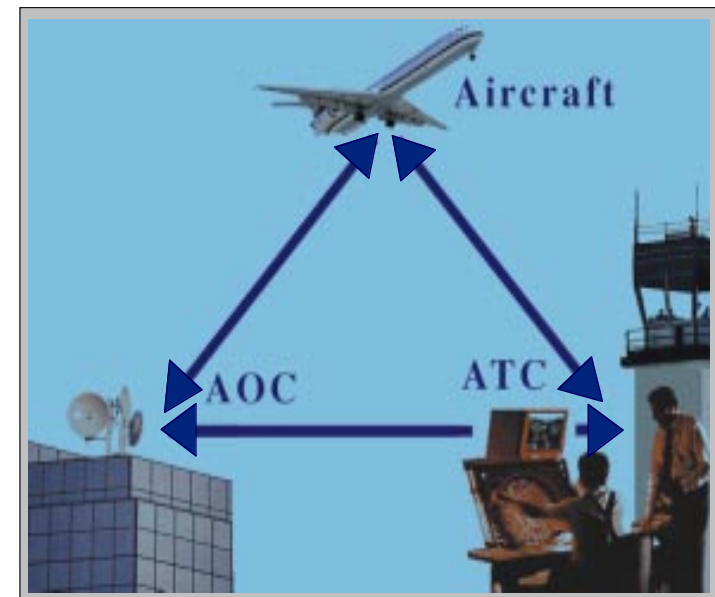
**Seagull Technology, Inc.**

**AATT NRA Workshop  
23 March, 1999**



# Objectives

- **Develop a full, distributed human-in-the-loop simulation of air-traffic-management operations to evaluate the feasibility and merit of various Free-Flight concepts:**
  - **Distributed air-ground separation**
  - **Airborne flight planning / re-planning**
  - **Required CNS infrastructure**
- **Investigate system performance as a function of key issues:**
  - **mixed equipage (independent vs. dependent vs. basic aircraft)**
  - **ADS-B range dependency**
  - **wind prediction accuracy, GPS inaccuracies**
  - **FIS, TIS update rates, data latencies**





# Tasks

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- 1) Design a simulation architecture that will be flexible and modular**
- 2) Realize a Pilot Station capability**
- 3) Realize a Pseudo-Pilot Station capability**
- 4) Realize an ATC Station capability**
- 5) Develop first-generation CNS infrastructure models**
- 6) Develop a generic interface for airborne CD&R modules (collaboration with RTOs 4, 5a, 5b)**
- 7) Develop initial candidate traffic scenarios**
- 8) Initial testing of simulation infrastructure**



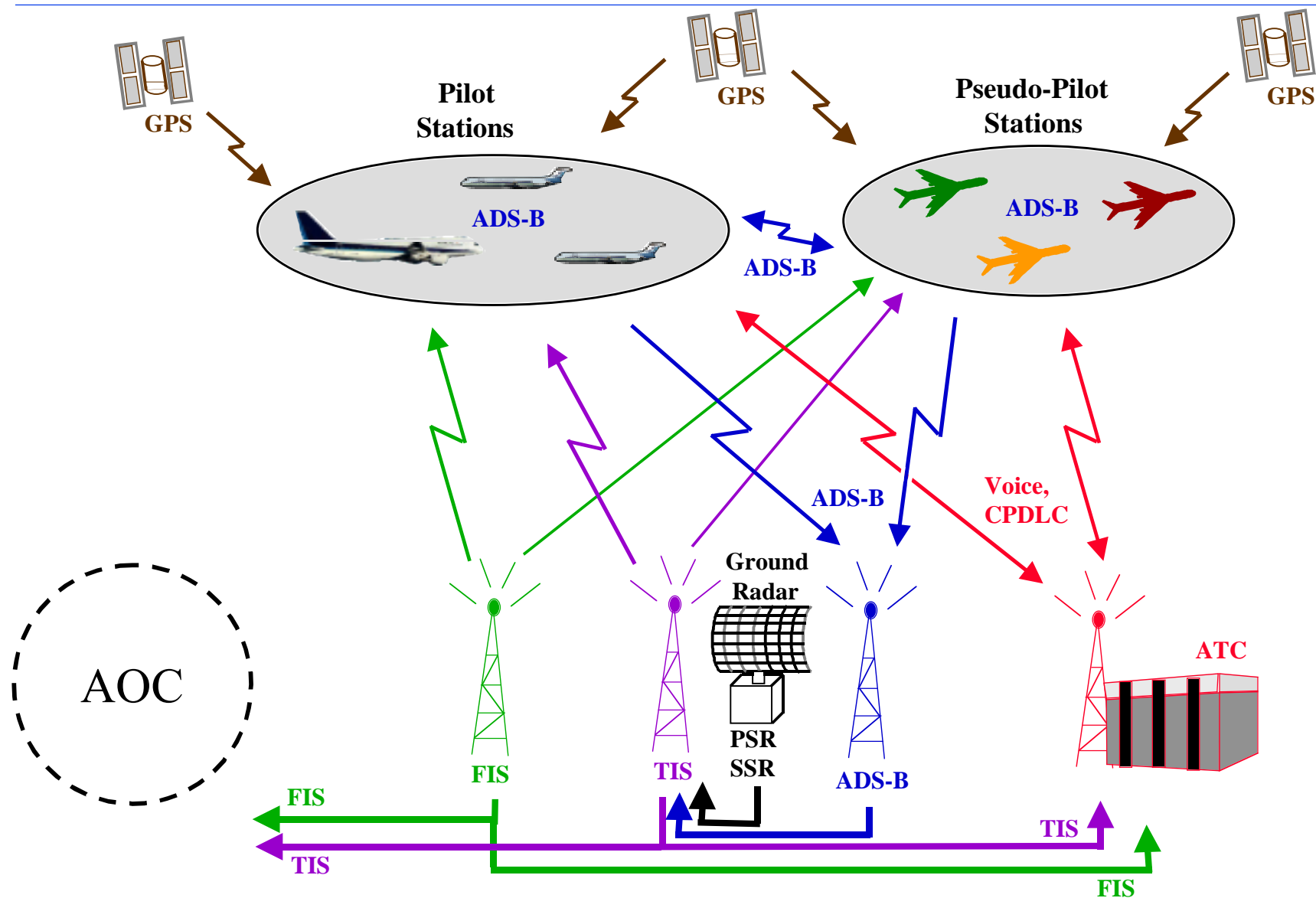
# Results

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- ✓ 1) Design a simulation architecture that will be flexible and modular
- ✓ 2) Realize a Pilot Station capability
- ✓ 3) Realize a Pseudo-Pilot Station capability
- ✓ 4) Realize an ATC Station capability
- ✓ 5) Develop first-generation CNS infrastructure models
- ✓ 6) Develop a generic interface for airborne CD&R modules (collaboration with RTOs 4, 5a, 5b)
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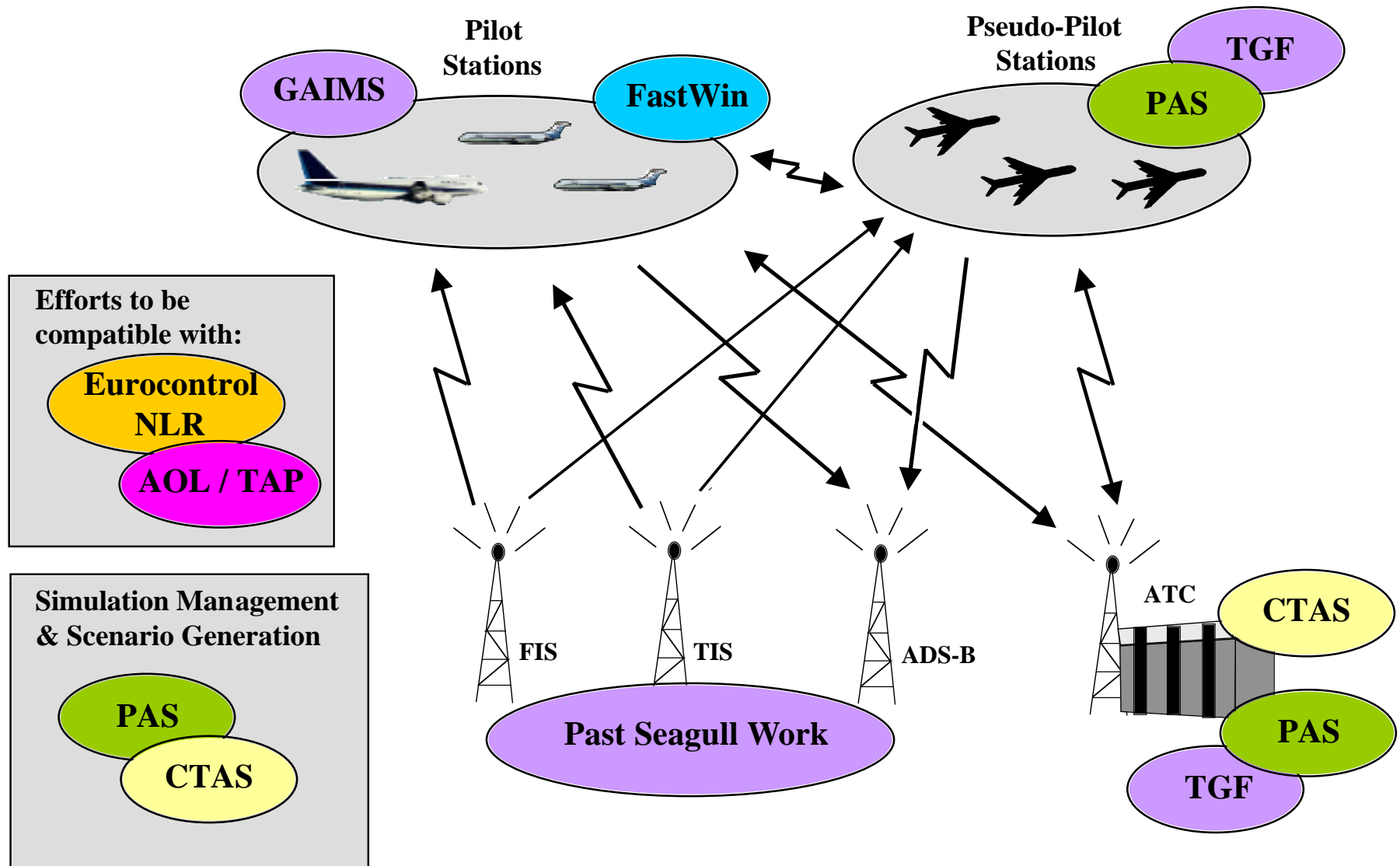


# High-Level Simulation Infrastructure Components



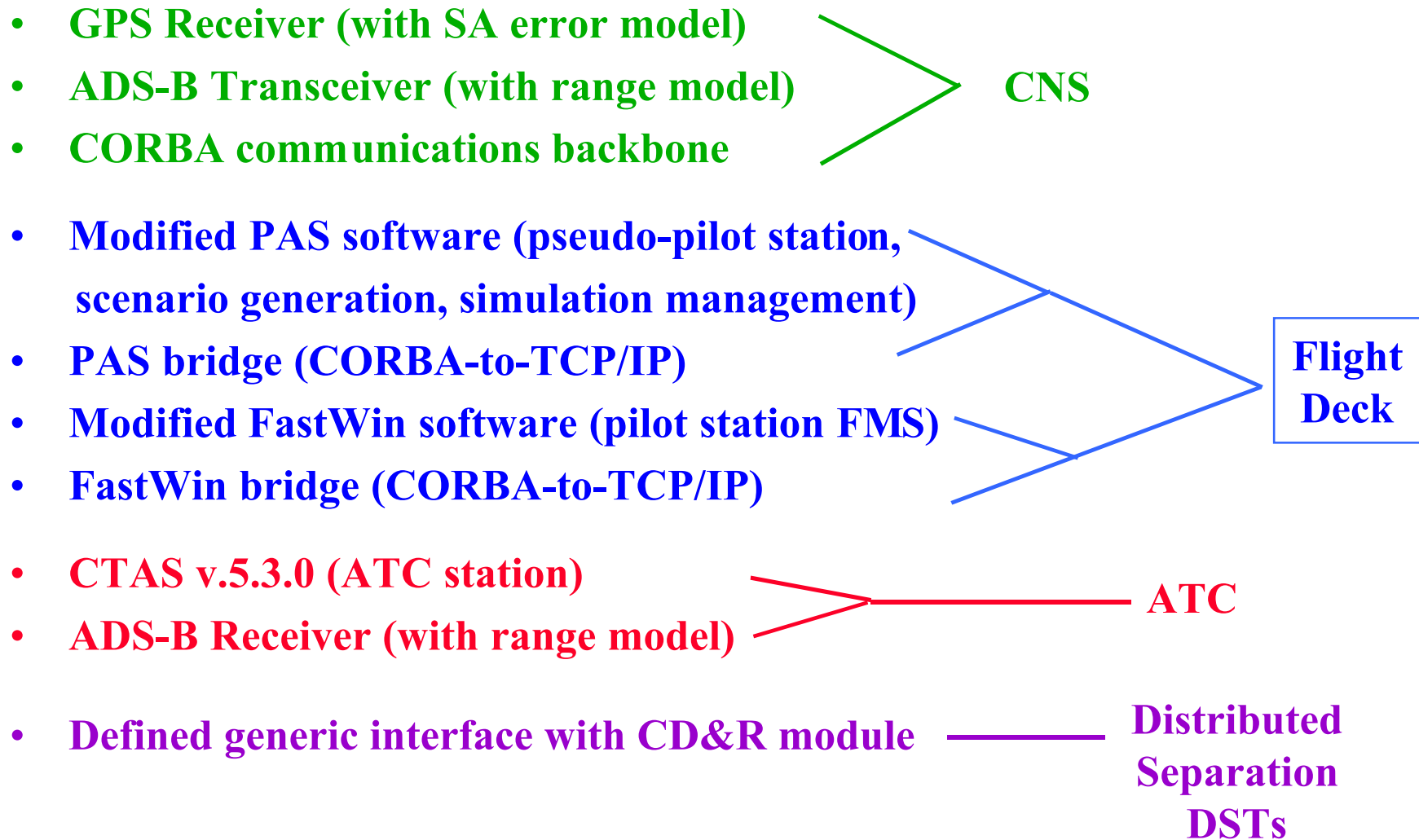


# Leveraged Existing Components



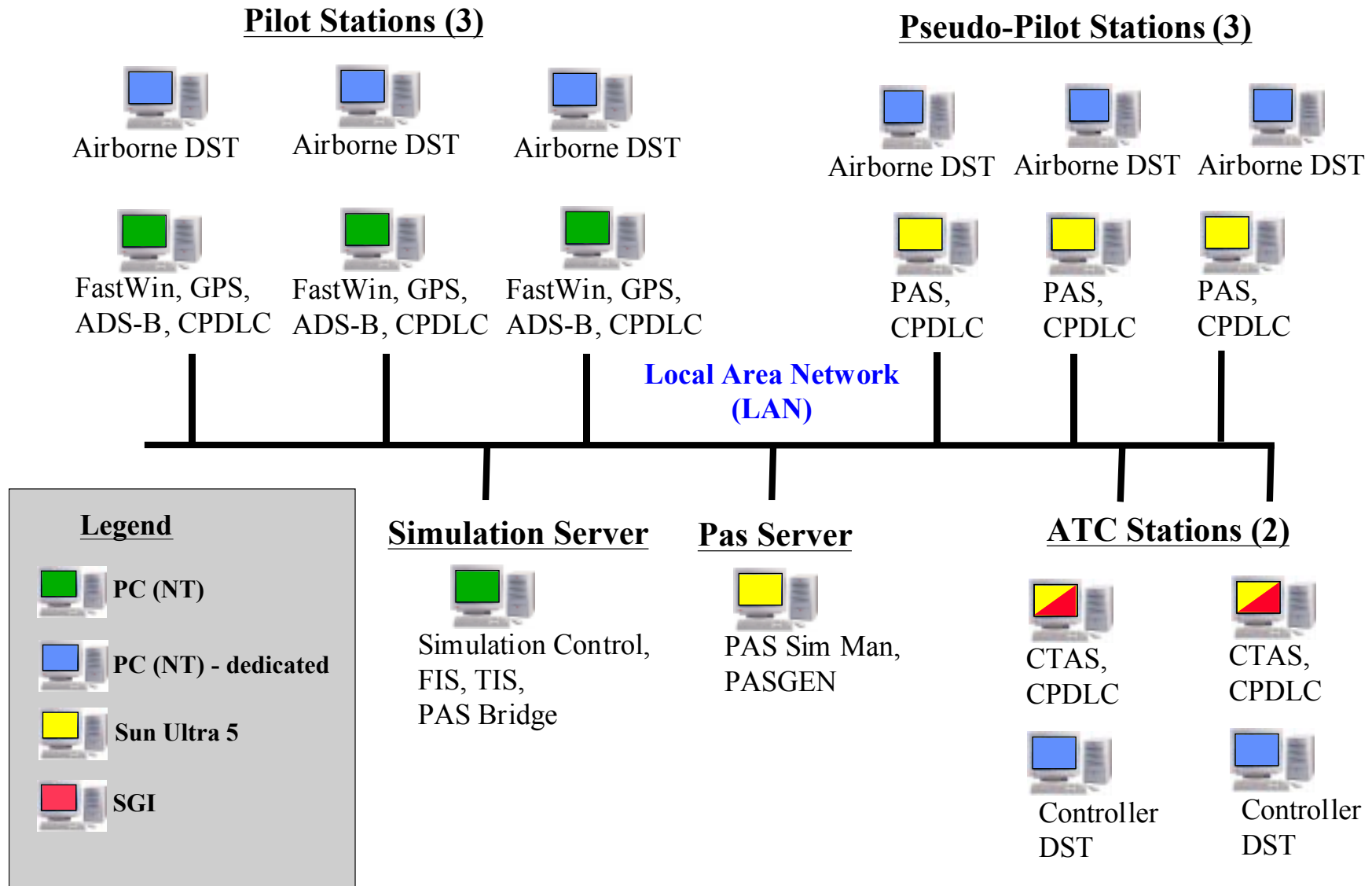


## Delivered Software on Schedule (Nov 1998)





# Simulation Deployment Diagram







# Conclusions

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- **RTO-3 was extremely ambitious, yet successful**
- **A flexible and modular simulation architecture has been developed**
- **Comprehensive modeling of CNS components is an important focus and we are continuing to mature**
- **It is possible to leverage past and existing ATM research efforts**
- **Europeans have a lot to offer (NLR, Eurocontrol)**
- **Still a lot more work to do**
- **Follow-on contract: RTO-21**



# RTO-21: Follow On

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## 1999

- **CPDLC**
- **Integration of flight-deck CD&R DST**
- **Integration of prototype ground-based CD&R DST**
- **FIS**
- **Ground radar and TIS**
- **ADS-B enhancements (e.g. model message-collisions)**
- **Integration of CDTI**

## Beyond

- **Additional modification of FastWin**
- **Additional modification of PAS**
- **Display integration**